

REMARKS

This is in response to the Office Action of April 28, 2008. Claim 1 is amended, based upon such disclosure as that in lines 17-19 on page 14 and in lines 21-23 on page 3 of the specification. A typographical error is corrected in claim 8. New claim 16 is added, based upon such disclosure as that in the first full paragraph of the section of the specification entitled "Best Mode for Carrying Out the Invention" – page 5, lines 2-14 ("Reinforcing fiber yarns forming a sheet-shaped member of the present invention ... are made of multifilaments that form a flat shape without twists. The multifilaments are preferably designed to have a degree of flatness of not less than 2 Particularly preferable degree of flatness is in a range from 20 to 700"). No new matter is introduced by this Amendment. With this Amendment, claims 1, 2, 5, and 7-16 are pending in the application.

The 35 U.S.C. § 112 rejection

Claims 1, 2, 5, and 7-15 stand rejected under the second paragraph of 35 U.S.C. § 112 as failing to define the invention properly. Office Action, page 2. The Examiner indicates that the claim 1 recitation "that the reinforcing fibers are thermo-compression and formed into a sheet shape" is unclear. The present amendment removes that language from the claims. It is respectfully submitted that the claims as amended herein comply with the requirements of the statute.

The prior art rejection

Claims 1, 2, 5, and 7-15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over US 2001/0006866 A1 (Kuroiwa) in view of US 6,641,763 B2 (Nakamura) and US 5,452,507 (Brunner). Office Action, pages 2-4. It is respectfully submitted that this ground of rejection does not apply to claims 1, 2, 5, and 7-16 as they are currently pending in the application.

Relationship between flat shape of reinforcing yarn and sheet shape

The present invention relates to reinforcing non-woven base fabrics that are used for externally reinforcing and repairing concrete structures, and also to reinforcing non-woven base

fabrics which are used for fiber-reinforced polymers. Specification, page 1, lines 6-9.

The Examiner's attention is respectfully directed to Applicants' Figure 8, reproduced and annotated in Exhibit A. Figure 8 clarifies the relationship between the flat shape of reinforcing fiber yarn and the sheet shape (i.e., the overall shape of the reinforcing non-woven fabric).

As can be seen in Figure 8, the present invention uses reinforcing fiber yarns (82, 83) having a flat, untwisted shape. Multifilament yarns (81) made of polyolefin composite fibers having a core-sheath structure, which inherently have no adhesive property, are used to retain the fabric containing the reinforcing fiber yarns in a sheet shape. Due to this construction, there is no problem with voids and moisture-absorption, which cause difficulties in the maintenance and reinforcement of concrete and in the use in fiber-reinforced polymers. Neither Kuroiwa nor Nakamura nor Brunner, considered separately or considered together, places into the possession of the public a non-woven base fabric which is free from adverse effects such as moisture-absorbing properties and voids.

With respect to Kuroiwa, Kuroiwa disclosed a multiaxially laminated non-woven fabric. Kuroiwa does not disclose that reinforcing fiber yarns can form a sheet shape and be retained in the sheet shape by using a support fibrous member, as in the present invention. This is a major deficiency of the primary reference. Kuroiwa also fails to disclose carbon fibers, glass fiber, boron fibers, or steel fibers. Brunner is cited to remedy that deficiency in the Kuroiwa reference. However, the disclosure of Brunner merely teaches that carbon fibers, glass fibers, boron fibers, etc., are in general known for use as reinforcing fibers in fiber-reinforced polymers for its invention. Brunner provides no relevant disclosure beyond that. Similarly, Nakamura does not cure the deficiencies of the other references, as Nakamura is cited as disclosing the core-sheath structure. Office Action at page 3, lines 9-10.

In the present invention, reinforcing yarns (82, 83) are retained in a sheet shape by using a support fibrous member (81), as recited in the present claims and illustrated in Figure 8.

Thermo-compression

On page 4 of the Office Action, the Examiner argues that "With regard to the limitation that the fibers are thermo-compressed to form the sheet shape, Kuroiwa teaches laminating the layers by heat and pressure. See paragraph 0065." What Kuroiwa actually discloses in

paragraph [0065] is that “non-woven fabrics ... may also be bonded up by such bonding means as embossing, thermal pressing or through air. In that case, it is also possible to employ the above-mentioned embossing or like means while using an adhesive web as the other web so referred to hereinabove.” Even if this teaching in Kuroiwa is construed as teaching thermo-compression of fibers to form a sheet shape, as alleged by the Examiner, the Kuroiwa disclosure in no way suggests reinforcing fiber yarns that are flattened into a sheet shape by thermo-compression. The present claims expressly require “the reinforcing non-woven base fabric being formed by laminating and thermo-compressing the reinforcing fiber yarns and support fibrous member to form a sheet shape.”

Low basis weight

Applicants’ approach to making the presently claimed fabrics enables them to be produced at very low basis weights (“the weight of the reinforcing non-woven base fabric per 1 m² becomes very small”). See, for instance, the last full paragraph on page 28 of the specification. Kuroiwa has an opposite objective: “By using tows as such as starting materials in accordance with the [Kuroiwa] invention, non-woven fabrics having a great basis weight could be realized, ... most desirably 1 kg/m²”. Page 3, left column, paragraph [0045]. Compare the 1 kg/m², i.e., 1000 g/m², disclosed by Kuroiwa to the low basis weight fabrics which are enabled by the present invention, such as e.g. the 42 g/m² embodiment of the present invention disclosed on page 29 of Applicants’ specification. In addition to the other differences noted in these Remarks, Applicants’ technology thus differs significantly from that of Kuroiwa with respect to the basis weight of the fabrics which can be made by the respective technologies.

Degree of flatness – claim 16

Claim 16 requires – among many other things – a reinforcing non-woven base fabric which includes reinforcing fiber yarns having a sheet shape with a support fibrous member, wherein said sheet shape is formed from multifilaments which have a degree of flatness in a range from 20 to 700. Neither Kuroiwa nor Nakamura nor Brunner, alone or in combination, teaches or suggests the employment of reinforcing fiber yarns having the recited degree of flatness in the context of the present invention.

Combination of precise structural choices

It is manifest that claims 1, 2, 5, and 7-16 as presented herein are concerned with technology that differs significantly from the technology of the Kuroiwa and Nakamura and Brunner disclosures. Applicants achieve their objectives by providing reinforcing fiber yarns having a sheet shape with a support fibrous member wherein the sheet shape is formed from flat multifilaments. In Applicants' invention, the reinforcing fiber yarn is made of carbon fiber, glass fiber, boron fiber, and steel fiber. In Applicants' invention, the support fibrous member is formed of multifilament yarn made of composite fibers constituted by two or more olefin-based polymers having a difference in melting points. Beneficial properties such as freedom from voids and absence of water-absorption properties flow from these combined structural aspects of Applicants' invention. The prior art does not provide the structure required by Applicants' claims, and does not provide the benefits which are derived from that structure. Accordingly, withdrawal of the rejection of record is therefore in order and is earnestly solicited.

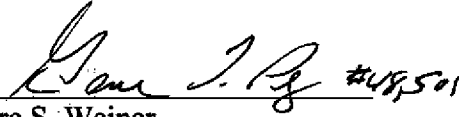
Contact information

If there are any questions concerning the present application, the Examiner is respectfully requested to contact Richard Gallagher (Reg. No. 28,781) at (703) 205-8008.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Dated: July 23, 2008

Respectfully submitted,

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Attachment: Exhibit A

EXHIBIT A

Fig. 8

